4-23-2015

Food addiction and added sugar consumption in college-aged females

Sophia F. Stangl

College of Saint Benedict/Saint John's University

FOOD ADDICTION AND ADDED SUGAR CONSUMPTION IN COLLEGE-AGED FEMALES.

Sophia F. Stangl and Amy Olson PhD, RD, LD. College of St. Benedict, St. Joseph, MN.

Abstract:
Addiction to highly refined foods, specifically sugar, may result in excessive caloric intake, which enhances comorbidity risks, such as obesity and cardiovascular disease. The American Heart Association recommends that women limit "added sugar" intake to 25 g per day (1). **Purpose**: To determine the relationship between food addiction and sugar consumption. **Methods**: IRB approved the study, and IT Services sent out a recruitment email to 1992 college-aged females. Participants gave their informed consent and completed two surveys: the Yale Food Addiction Scale (YFAS) (n=160) and the Automated Self-Administered 24-hour dietary recall (ASA24) (n=57). The YFAS questionnaire categorized individuals into two groups based on the DSM-IV substance abuse criteria: food dependents, or food addicts, and non-food dependents, or non-food addicts. The ASA24 analyzed participants' dietary recalls of all foods/beverages consumed in the last 24 hours. T-tests and ANOVAs compared nutrition intakes of food dependents with non-food dependents. **Results**: The YFAS categorized the respondents as 31.3% food dependent (n=50) and 68.8% non-food dependent (n=110); 13 food dependents and 44 non-food dependents completed the ASA24. Only 35.6% of participants (n=57) complete both surveys. The range of "added sugar" consumed was 0.3 – 75t. Food addicts consumed 15 ± 20 g of "added sugar" and non-food addicts consumed 10 ± 7 g of "added sugar"; however, there was no statistical difference between groups (p=0.158). Food dependents consumed less sodium than non-food dependents, 2308 ± 681 mg and 2980 ± 1051 mg sodium respectively, which was statistically significant (p=0.034). **Conclusions –** A food addiction diagnosis did not correlate with a higher " sugar intake in this study (p>0.05), and food addicts consumed a significantly lower amount of sodium than non-food addicts (p=0.034). A surprising percent of college-aged females were categorized as food addicts (31.3%), which is higher than other reports (8.8%). Most food addicts and non-food addicts (72%) are consuming more than the American Heart Association's recommended amount of "added sugar" (<25 grams per day).

Introduction:
Addiction to highly refined foods, specifically sugar, may result in excessive caloric intake, which enhances chronic disease risk, such as obesity and cardiovascular disease. Daily sugar sweetened beverage consumption is associated with obesity, insulin resistance, hypertension, and cardiovascular disease (2, 686; 3, 512). Added sugars are sugars and syrups put into foods during processing or preparation (4, 1; 1, 1). The American Heart Association recommends that women and men should limit daily added sugar intake to 100 cal (25 g) and 150 cal (37.5 g) respectively (5, 2; 1, 1). The World Health Organization recommends reducing added sugar intake to 100 cal (25 g) a day for adults (6, 1).

Sugar triggers a positive response in the brain when ingested by stimulating the release of dopamine in the nucleus accumbens (NAcc) (7, 83). The NAcc is a reward center, thus dopamine release causes pleasure. Foods that are more rewarding release more dopamine in the NAcc (8, 430). Sweets can also cause the release of endogenous opiates in the brain (8,

430). The endogenous opiates create a strong positive response thus the brain craves more opiates, which is likely to make the consumer intake more food. Sugar and cocoa in chocolate create psychoactive effects, such as responses of well-being and euphoria; increased percentages of sugar and/or cocoa in chocolate strengthened individuals' motivation to consume more (9, 119). Women consumed a larger percentage of their total calories from sugar than men: 13.2% and 12.7% respectively (4, 2).

The Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition (DSM-IV) was created in 1994. The DSM-IV diagnoses individuals with substance abuse or substance dependence based on seven criteria: substance taken in larger amounts for a longer time than intended, attempts to cut down or quit, a large amount of time spent to obtain and use the substance, important activities decreased or given up, continued use despite negative consequences, tolerance, and withdrawal (10, 2). Overweight, middle-aged women took a written survey based on the seven DSM-IV substance dependence criteria to determine if overconsumption caused by addiction to refined foods obeyed the DSM-IV criteria in 2008 (11, 518). Addiction to refined foods, such as flour, fat, and sugar, met the DSM-IV criteria for substance abuse (11, 524).

Food addiction affects a wide variety of people. Lean and obese people are at risk although food addiction is more prevalent in those with higher BMI (12, 578 and 581). Younger people are more often affected than older people, and women are two times more likely to be food addicts than men (12, 580-581; 13, 300). Normal-weight college-aged persons reported a food addiction diagnosis in 8.8% of individuals (12, 582). The purpose of this study was to determine the prevalence of food addiction and the relationship between food addiction and added sugar consumption in college-aged females.

Methods:

The Institutional Review Board approved the study, and all participants provided consent before beginning the research. Participants had to complete two surveys: the Yale Food Addiction Scale (YFAS) survey and the Automated Self-Administered 24-hour Recall (ASA24) dietary recall.

Food addiction was quantified using the YFAS. The YFAS was a questionnaire, based on the DSM-IV, which recognized seven symptoms of food addiction. A participant was identified as substance dependent, a food addict, if she met three or more of the symptoms. The YFAS questions were placed on Forms Manager, which allowed participants to fill out the survey online. Questions assessed the eating behaviors of a participant; for example, question number one states, "I find that when I start eating certain foods, I end up eating much more than planned." The participant selected if this statement fits her behavior: never, once a month, 2-4 times a month, 2-3 times a week, or 4 or more times a week.

Participants completed a dietary recall of all foods/beverages consumed in the past 24 hours. The ASA24 was the online tool used to collect participants' dietary recalls; 80 nutrients were

identified and quantified. The ASA24 utilized images and serving sizes to make completing a dietary recall a user-friendly process. Caloric intake values from each participant were assessed and compared to a participant's YFAS label as a food addict or a non-food addict.

Recruitment was conducted via a campus wide email seeking college-aged females at the College of Saint Benedict. A sample of 1992 women was asked to participate; 161 females completed the YFAS, and 56 females completed both the YFAS and the ASA24. IT Services sent out the recruitment and reminder emails and provided each participant with a username and password to maintain confidentiality. The username and password were used to link the results from the YFAS and the ASA24. The surveys were completely anonymous, and the head researcher had no way to associate the usernames with the participants.

Anticipated problems with the YFAS and ASA24 were access and completion. The participant needed to complete the surveys on a computer because the ASA24 is not tablet or phone accessible. Participants who completed the YFAS and the ASA24 were placed into a gift card drawing to win one of four $25 gift cards as incentive. Reminder emails were sent out to notify a participant if she had not yet completed a portion of the research.

Statistical Package for the Social Sciences (SPSS) was used to compare YFAS food addiction with ASA24 caloric intake values. ANOVA and paired t-tests analyzed the intake of food addicts against non-food addicts. Descriptive statistics averaged the caloric intake of 80 different nutrients.

Results:

A sample of 160 participants filled out the YFAS; 50 participants were categorized as food addicts (31.3%). A sample of 57 participants filled out the ASA24, 13 of which were food addicts (22.8%).

The YFAS recognizes seven criteria that contribute to food addiction (14, 2). The percent of participants that met each criterion is depicted in Figure 2. The criteria include:

1) Substance taken in larger amount and for longer period of time than intended.
2) Persistent desire or repeated unsuccessful attempts to quit.
3) Much time/activity to obtain, use, and recover.
4) Important social, occupational, or recreational activities given up or reduced.
5) Use continues despite knowledge of negative consequences.
6) Tolerance (marked increase in amount; marked decrease in effect).
7) Characteristic withdrawal symptoms; substance taken to relieve withdrawal.

89% of participants met criterion 2, unsuccessful attempts to quit consuming a substance (Figure 1).

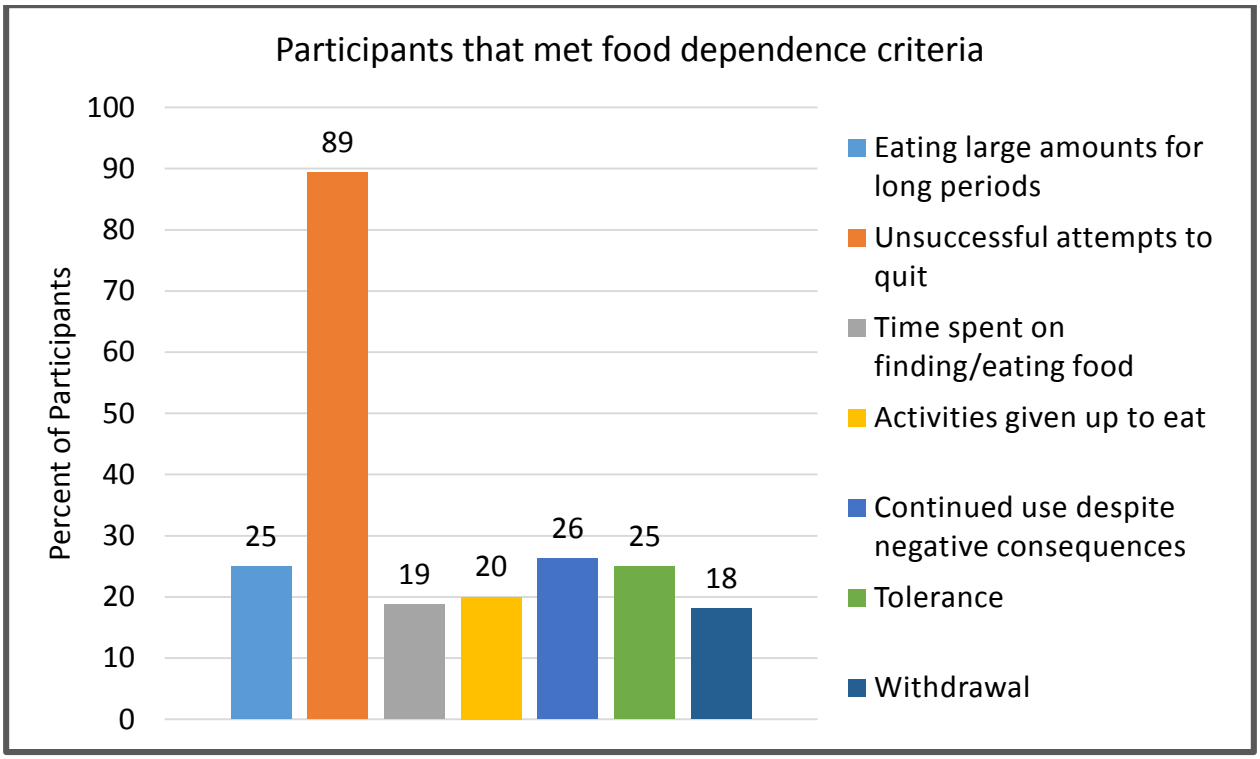

Figure 1: YFAS criteria met by participants.

Four times a week or more, 16.3% of participants indicated eating more of certain foods than expected, 21.3% of participants indicated continuing to consume despite no longer being hungry, and 30% of participants indicated worrying about cutting down certain types of food (appendix I).

Participants reported psychological and physical problems associated with food intake. Food consumption caused 16.3% of participants' physical problems or made a physical problem worse. Eating certain foods does not reduce 21.9% of participants' negative emotions/increase pleasurable emotions as much as in the past. 26.3% of participants continued consuming the same type or amount of foods even though emotional/physical problems were association with those foods. Food consumption has caused 31.9% of participants to experience significant psychological problems.

Participants reported attempts at cutting back on certain foods. 78.1% of participants want to cut down on certain foods. 90% of participants tried to cut down certain foods. 62.5% of participants succeeded in cutting down certain foods.

Participants indicated foods that they want to cut, tried to cut, or cut (Figure 2).

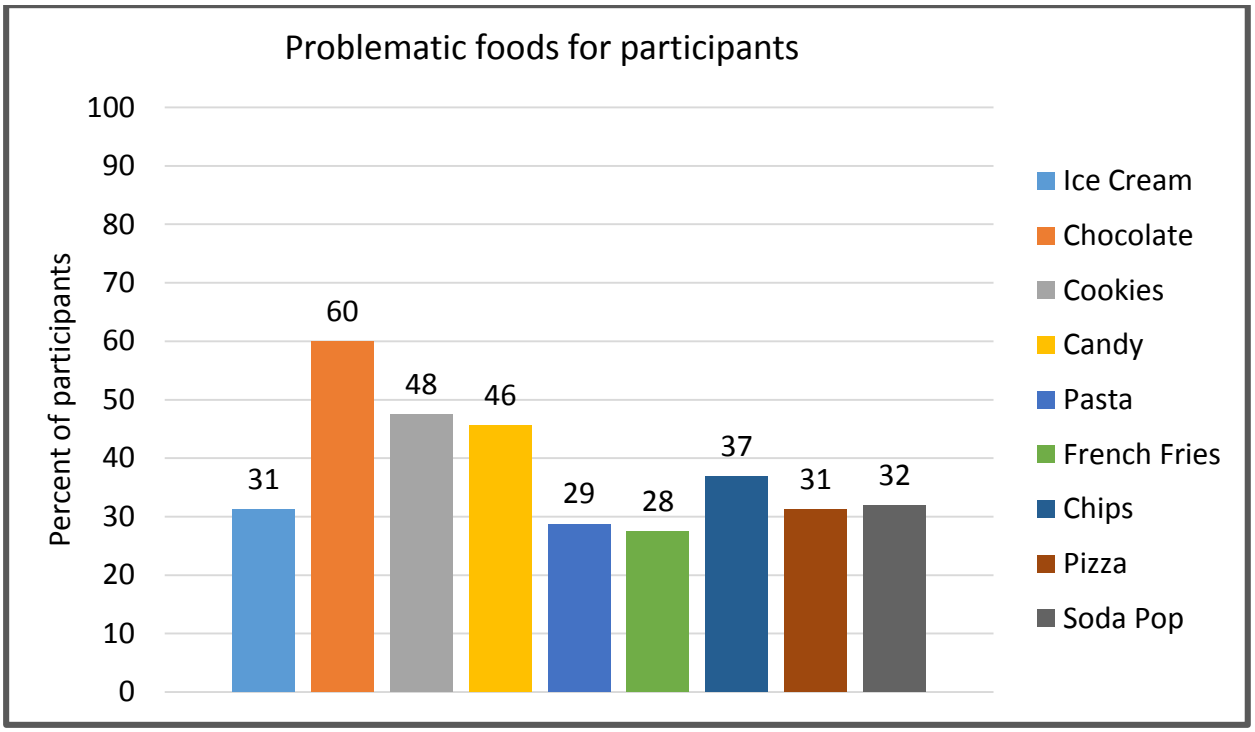

Figure 2: Foods of which participants have struggled to control consumption in the past year.

The average intake of added sugar of food addicts was 15 ± 20 t; the average intake of added sugar of non-food addicts was 10 ± 7 t. The range of sugar consumed in the 57 participants that filled out the dietary recall was 0.3 – 79 t. The average intake of sodium of food addicts was 2308 ± 681 mg; the average intake of sodium of non-food addicts was 2980 ± 226 mg (appendix II). There was not significant difference of added sugar consumption between food addicts and non-food addicts ($p=0.242$), but there was a significant difference of sodium consumption between food addicts and non-food addicts ($p=0.034$): non-food addicts consumed significantly more sodium than food addicts (appendix III). There was nearly a significant difference in vitamin D intake ($p=0.087$) and milk cup equivalent consumption ($p=0.057$) with food addicts consuming less of each nutrient.

Discussion:

The present study reports the first to compare food addiction categorization with nutrient intake. The YFAS labeled 50 participants as food addicts (31.3%); this prevalence was startlingly higher when compared to other universities (9%) (12, 582). The large percentage of food addicts may be due to two factors. The title of the recruitment email, Food Craving Survey, may have drawn a biased population to participate. Women were the sole participants of the research, and women are two times more likely to be food addicts than men (13, 300).

There was no relationship between food addiction categorization and added sugar consumption, but there was a relationship observed between food addiction categorization and sodium consumption. Specifically, non-food addicts consumed more sodium than food addicts. It is possible that food addicts are constantly thinking about their intake and therefore consume

less sodium, or limit their intake, more often than non-food addicts; yet, this is unlikely because more non-food addicts that completed the ASA24 stated that they succeeded in cutting or limiting certain foods (32%) than food addicts that completed the ASA24 (15%).

Eating behaviors, problematic foods, and average intake values were also observed in this study. The population as a whole did not meet dietary recommendations of calcium, fiber, water, iron, magnesium, potassium, zinc, folate, vitamin E, vitamin D, choline, vegetables, and meat/fish intake (appendix IV). Non-food addicts did meet calcium and vitamin A recommendations whereas food addicts did not. Food addicts and non-food addicts surpassed the upper limit of sodium and added sugar intake. Information gained in this report is important because nutrients missing in food addicts' and non-food addicts' diets will educate them on which foods they should intake to meet recommendations. Information may help participants to control their diet in areas that may be troublesome because food addiction could result in over intake of empty calories.

Future research should include a larger, more random population and to find a more effective way to get participants to complete dietary recalls. The ASA24 took an hour to complete, which deterred many participants from completing a recall. Future research should compare food addiction diagnosis in college-aged males with caloric consumption and compare food addiction prevalence in college-aged males with that of college-aged females. In addition, future research should examine participants' diets to see what sources are providing the majority of added sugar and sodium.

Conclusion:
A food addiction diagnosis did not correlate with a higher " sugar intake in this study, and food addicts consumed a significantly lower amount of sodium than non-food addicts. A surprising percent of college-aged females were categorized as food addicts, which is higher than other reports. Most food addicts and non-food addicts (72%) are consuming more than the American Heart Association's recommended amount of "added sugar" (<25 grams per day). Participants of the current study consume less added sugar (12t/d) than the women's national average (15t/d) (4, 1-2). All individuals should be conscious of their added sugar consumption because of the chronic diseases associated with an increased intake.

If the prevalence of food addiction is an accurate portrayal of a normal female college population, universities should provide students with opportunities to learn added sugar intake recommendations, effects of overconsumption, and healthy eating behaviors and attitudes in order to prevent possible chronic disease occurrence.

Acknowledgements:
Thank you to Dr. Amy Olson, the participants in the study, Dr. Philip Byrne, Mr. Randy Hammond, Dr. Richard Wielkiewicz, and CSBSJU Undergraduate Research Program.

References:

1. American Heart Association. (2014). Added sugars. *American Heart Association.* 1-2. http://www.heart.org/HEARTORG/GettingHealthy/NutritionCenter/Sugars-101_UCM_306024_Article.jsp

2. Kumar, G.S., Pan, L., Park., S., Lee-Kwan, S.H., Onufrak, S., and Blank, H.B. (2014). Sugar-sweetened beverage consumption among adults – 18 states, 2012. *Centers for Disease Control and Prevention, 63*(32), 686-690. http://www.cdc.gov/mmwr/preview/mmwrhtml/mm6332a2.htm

3. Wang, J. (2014). Consumption of added sugars and development of metabolic syndrome components among a sample of youth at risk of obesity. *Applied Physiology, Nutrition, and Metabolism,* 39(4), 512. http://www.nrcresearchpress.com/doi/abs/10.1139/apnm-2013-0456?url_ver=Z39.88-2003&rfr_id=ori%3Arid%3Acrossref.org&rfr_dat=cr_pub%3Dpubmed&#.VH6BXL7A2tq

4. Ervin, R.B. and Ogden, C.L. (2013). Consumption of added sugars among U.S. adults, 2005-2010. *U.S. Department of Health and Human Services, 122,* 1-8. http://www.cdc.gov/nchs/data/databriefs/db122.pdf

5. American Heart Association. (2014). Sugar 101. *American Heart Association.* 1-3. http://www.heart.org/HEARTORG/GettingHealthy/NutritionCenter/Sugars-101_UCM_306024_Article.jsp

6. Wilson, J. (2014). WHO-proposed sugar recommendation comes to less than a soda per day. *Cable News Network,* 1-2. http://www.cnn.com/2014/03/06/health/who-sugar-guidelines/

7. Hone-Blanchet, A. and Fecteau, S. (2014). Overlap of food addiction and substance use disorders definitions: Analysis of animal and human studies. *Neuropharmacology,* 85, 91-90. http://www.ncbi.nlm.nih.gov/pubmed/24863044.

8. Gearhardt, A. N., Corbin, W.R., and Brownell, K.D. (2009). Preliminary validation of the Yale Food Addiction Scale. *Appetite,* 52, 430-436. http://www.yaleruddcenter.org/resources/upload/docs/what/addiction/foodaddictionscalearticle09.pdf.

9. Nasser, J.A., Bradley, L.E., Leitzsch, J.B., Chohan, O., Fasulo, O., Haller, J., …, and Parigi, A.D. (2011). *Psyiology & Behavior,* 104, 117-121. http://www.sciencedirect.com/science/article/pii/S0031938411001995

10. American Psychiatric Association. (2013a). Alcohol use disorder: A comparison between DSM-IV and DSM-5. *National Institute on Alcohol Abuse and Alcoholism.* 1-2. http://pubs.niaaa.nih.gov/publications/dsmfactsheet/dsmfact.htm.

11. Ifland, J.R., Preuss, H.G., Marcus, M.T., Rourke, K.M, Taylor, W.C., Burau, K., . . ., Manso, G. (2009). Refined food addiction: A classic substance use disorder. *Medical Hypotheses,* 72, 518-526. http://www.ncbi.nlm.nih.gov/pubmed/19223127.

12. Flint, A.J., Gearhardt, A.N., Corbin, W.R., Brownell, K.D., Field, A.D., and Rimm, E.B. (2014). Food-addiction scale measurement in 2 cohorts of middle-aged and older women. *American Society for Nutrition, 99*, 578-86. http://ajcn.nutrition.org/content/early/2014/01/22/ajcn.113.068965.abstract.

13. Hebebrand, J., Albayrak,Ö., Adan, R., Antel, J., Dieguez, C., Jong, J., …, and Dickson, S.L. (2014). “Eating addiction", rather than "food addiction", better captures addictive-like eating behavior. *Neuroscience and Biobehavioral Reviews. 47,* 295-306. http://www.sciencedirect.com/science/article/pii/S0149763414002140

14. Gearhardt, Corbin, & Brownell. (2008). Instruction sheet for the Yale Food Addiction Scale. 1-2. http://www.yaleruddcenter.org/resources/upload/docs/what/addiction/FoodAddictionScaleInstructions09.pdf.

15. Dietary reference intakes. (2010). http://www.hc-sc.gc.ca/fn-an/alt_formats/hpfb-dgpsa/pdf/nutrition/dri_tables-eng.pdf

Appendix:

I.

IN THE PAST 12 MONTHS:	Never	Once a month	2-4 times a month	2-3 times a week	4 or more times a week or daily	Response Count	Skipped Row
1. I find that when I start eating certain foods, I end up eating much more than planned.	1.9% (3)	6.3% (10)	30.6% (49)	**45.0% (72)**	16.3% (26)	160	0
2. I find myself continuing to consume certain foods even though I am no longer hungry.	1.9% (3)	11.9% (19)	**35.6% (57)**	29.4% (47)	21.3% (34)	160	0
4. Not eating certain types of food or cutting down on certain types of food is something I worry about.	13.1% (21)	10.6% (17)	20.0% (32)	26.3% (42)	**30.0% (48)**	160	0
6. I find myself constantly eating certain foods throughout the day.	10.6% (17)	26.3% (42)	**27.5% (44)**	25.0% (40)	10.6% (17)	160	0

IN THE PAST 12 MONTHS:	Never	Once a month	2-4 times a month	2-3 times a week	4 or more times a week or daily	Response Count	Skipped Row
3. I eat to the point where I feel physically ill.	**41.3% (66)**	36.3% (58)	17.5% (28)	3.1% (5)	1.9% (3)	160	0
5. I spend a lot of time feeling sluggish or fatigued from overeating.	31.9% (51)	**36.3% (58)**	21.9% (35)	6.9% (11)	3.1% (5)	160	0
7. I find that when certain foods are not available, I will go out of my way to obtain them. For example, I will drive to the store to purchase certain foods even though I have other options available to me at home.	**48.8% (78)**	31.9% (51)	14.4% (23)	3.8% (6)	1.3% (2)	160	0
9. There have been times when I consumed certain foods so often or in such large quantities that I spent time dealing with negative feelings from overeating instead of working, spending time with my family or friends, or engaging in other important activities or recreational activities I enjoy.	**60.6% (97)**	20.0% (32)	6.9% (11)	6.9% (11)	5.6% (9)	160	0
12. I have had withdrawal symptoms such as agitation, anxiety, or other physical symptoms when I cut down or stopped eating certain foods. (Please do NOT include withdrawal symptoms caused by cutting down on caffeinated beverages such as soda pop, coffee, tea, energy drinks, etc.)	**76.9% (123)**	13.1% (21)	4.4% (7)	3.1% (5)	2.5% (4)	160	0

13. I have consumed certain foods to prevent feelings of anxiety, agitation, or other physical symptoms that were developing. (Please do NOT include consumption of caffeinated beverages such as soda pop, coffee, tea, energy drinks, etc.)	**44.4% (71)**	30.0% (48)	16.9% (27)	2.5% (4)	6.3% (10)	160	0
14. I have found that I have elevated desire for or urges to consume certain foods when I cut down or stop eating them.	25.0% (40)	**37.5% (60)**	24.4% (39)	9.4% (15)	3.8% (6)	160	0
15. My behavior with respect to food and eating causes significant distress.	**48.8% (78)**	23.8% (38)	10.0% (16)	7.5% (12)	10.0% (16)	160	0
16. I experience significant problems in my ability to function effectively (daily routine, job/school, social activities, family activities, health difficulties) because of food and eating.	**64.4% (103)**	17.5% (28)	9.4% (15)	4.4% (7)	4.4% (7)	160	0

IN THE PAST 12 MONTHS:

	Never	Once a month	2-4 times a month	2-3 times a week	4 or more times a week or daily	Response Count	Skipped Row
8. There have been times when I consumed certain foods so often or in such large quantities that I started to eat food instead of working, spending time with my family or friends, or engaging in other important activities or recreational activities I enjoy.	**76.3% (122)**	13.1% (21)	8.1% (13)	0.6% (1)	1.9% (3)	160	0
10. There have been times when I avoided professional or social situations where certain foods were available, because I was afraid I would overeat.	**86.3% (138)**	8.1% (13)	4.4% (7)	0.0% (0)	1.3% (2)	160	0
11. There have been times when I avoided professional or social situations because I was not able to consume certain foods there.	**89.4% (143)**	5.6% (9)	3.8% (6)	0.0% (0)	1.3% (2)	160	0

IN THE PAST 12 MONTHS:

	No	Yes	Response Count	Skipped Row
17. My food consumption has caused significant psychological problems such as depression, anxiety, self-loathing, or guilt.	**68.1% (109)**	31.9% (51)	160	0
18. My food consumption has caused significant physical problems or made a physical problem worse.	**83.8% (134)**	16.3% (26)	160	0

IN THE PAST 12 MONTHS:	No	Yes	Response Count	Skipped Row
19. I kept consuming the same types of food or the same amount of food even though I was having emotional and/or physical problems.	**73.8% (118)**	26.3% (42)	160	0
20. Over time, I have found that I need to eat more and more to get the feeling I want, such as reduced negative emotions or increased pleasure.	**89.4% (143)**	10.6% (17)	160	0
21. I have found that eating the same amount of food does not reduced my negative emotions or increase pleasurable feelings the way it used to.	**78.1% (125)**	21.9% (35)	160	0
22. I want to cut down or stop eating certain kinds of food.	21.9% (35)	**78.1% (125)**	160	0

IN THE PAST 12 MONTHS:	No	Yes	Response Count	Skipped Row
23. I have tried to cut down or stop eating certain kinds of food.	10.0% (16)	**90.0% (144)**	160	0
			Skipped All Rows	1

IN THE PAST 12 MONTHS:	No	Yes	Response Count	Skipped Row
24. I have been successful at cutting down or not eating these kinds of food.	37.5% (60)	**62.5% (100)**	160	0
			Skipped All Rows	1

IN THE PAST 12 MONTHS:	1 time	2 times	3 times	4 times	5 or more times	Response Count	Skipped Row
25. How many times in the past year did you try to cut down or stop eating certain foods altogether?	15.0% (24)	22.5% (36)	23.1% (37)	10.0% (16)	**29.4% (47)**	160	0

26. Please check ALL of the following foods you have problems with:			
Ice Cream		31.3%	50
Chocolate		60.0%	96
Apples		3.8%	6
Doughnuts		10.0%	16
Broccoli		1.9%	3
Cookies		47.5%	76
Cake		11.9%	19
Candy		46.3%	74
White Bread		19.4%	31
Rolls		15.6%	25
Lettuce		1.9%	3
Pasta		28.8%	46
Strawberries		1.3%	2
Rice		5.6%	9
Crackers		13.1%	21
Chips		37.5%	60
Pretzels		9.4%	15
French Fries		27.5%	44
Carrots		2.5%	4
Steak		4.4%	7
Bananas		3.8%	6
Bacon		9.4%	15
Hamburgers		8.1%	13
Cheeseburgers		12.5%	20
Pizza		31.3%	50
Soda Pop		31.9%	51
None of the above		7.5%	12

Table 1: Results from the Yale Food Addiction Scale questionnaire.

II.

FoodDep2		N	Mean	Std. Deviation	Std. Error Mean
KCal	Non-Food Dpnt	44	1732.83	516.85	77.92
	Food Dpnt	13	1857.62	1755.12	486.78

TFat (g)	Non-Food Dpnt	44	67.75	24.82	3.74
	Food Dpnt	13	66.10	64.87	17.99
Sugar (g)	Non-Food Dpnt	44	103.50	64.16	9.67
	Food Dpnt	13	148.27	225.96	62.67
Sodium (mg)	Non-Food Dpnt	44	2980.43	1050.96	158.44
	Food Dpnt	13	2307.71	680.82	188.82
SatFat (g)	Non-Food Dpnt	44	21.75	9.39	1.42
	Food Dpnt	13	30.98	50.39	13.97
MonoFat (g)	Non-Food Dpnt	44	25.08	10.21	1.54
	Food Dpnt	13	18.55	11.64	3.23
PolyFat (g)	Non-Food Dpnt	44	15.40	6.86	1.03
	Food Dpnt	13	11.13	6.71	1.86
AddSugar (t)	Non-Food Dpnt	44	10.30	7.30	1.10
	Food Dpnt	13	15.49	20.33	5.64

Table 2: Average consumption and standard deviation of eight different nutrients for non-food addicts (Non-Food Dpnt) and food addicts (Food Dpnt).

III.

ANOVA						
		Sum of Squares	df	Mean Square	F	Sig.
Sugar	Between Groups	20112.502	1	20112.502	1.401	.242
	Within Groups	789694.433	55	14358.081		
	Total	809806.935	56			
Sodium	Between Groups	4541348.981	1	4541348.981	4.708	.034
	Within	53056781.884	55	964668.762		

	Groups					
	Total	57598130.865	56			
SatFat	Between Groups	853.916	1	853.916	1.371	.247
	Within Groups	34261.921	55	622.944		
	Total	35115.837	56			
MonoFat	Between Groups	427.816	1	427.816	3.855	.055
	Within Groups	6104.509	55	110.991		
	Total	6532.325	56			
PolyFat	Between Groups	182.971	1	182.971	3.928	.052
	Within Groups	2561.764	55	46.578		
	Total	2744.735	56			
AddSugar	Between Groups	270.168	1	270.168	2.049	.158
	Within Groups	7250.569	55	131.829		
	Total	7520.737	56			

Table 3: One-way ANOVA results of eight different nutrients when comparing food addict consumption versus non-food addict consumption.

IV.

Nutrient	Food Addict consumption	Non-Food Addict consumption	Average consumption	RDA or AI or UL
Protein (g)	63	69	68	46
Total fat (g)	66	68	67	40-70
Carbohydrates (g)	267	221	232	130
Water (g)	2131	2218	2199	2700
Calcium (mg)	868	1005	974	1000

Fiber (g)	21	17	18	25
Iron (mg)	15	13	14	18
Magnesium (mg)	290	303	300	310
Phosphorous (mg)	1069	1290	1240	700
Potassium (mg)	2779	2617	2654	4700
Sodium (mg)	2308	2617	2827	2300
Zinc (mg)	10	10	10	11
Selenium (ug)	71	89	85	55
Vitamin C	95	79	83	75
Thiamin (mg)	1.3	1.4	1.4	1.1
Riboflavin (mg)	2	2	2	1.1
Niacin (mg)	20	21	21	14
Vitamin B6 (mg)	2	2	2	1.3
Folate total (ug)	337	353	349	400
Vitamin B12 (ug)	4	4	4	2.4
Vitamin A (RAE)	639	863	812	700
Vitamin E (mg)	11	8	9	15
Vitamin K (ug)	110	131	126	90
Vitamin D (ug)	3	5	5	15
Choline (mg)	252	292	282	425
Vegetables (c)	2	2	2	2.5
Fruit (c)	2	2	2	2
Dairy (c)	2	2	2	3
Meat and Fish (oz)	4	3	4	5.5
Added sugar (g)	77.5	51.5	55	30

Table 4: Average nutrient consumption of participants in comparison with the Recommended Daily Allowance (RDA), Adequate Intake (AI), or Upper Level (UL) (15).